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The Science of Public Health Practice: Using PBRNs for Delivery System Research in Public Health Settings

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PUBLIC HEALTH
Practice-Based Research Networks
National Coordinating Center

Missed opportunities in public health practice

Less than 50% of the population at risk is reached by:

- Smoking cessation
- Aspirin use
- Influenza vaccination
- Hypertension control
- Nutrition and physical activity programming
- HIV prevention
- Family planning
- Substance abuse prevention
- Interpersonal violence prevention
- Home visitation for high-risk mothers and infants

Why study public health practice?

"The Committee had hoped to provide specific guidance elaborating on the types and levels of workforce, infrastructure, related resources, and financial investments necessary to ensure the availability of essential public health services to all of the nation's communities. However, such evidence is limited, and there is no agenda or support for this type of research, despite the critical need for such data to promote and protect the nation's health."

—Institute of Medicine, 2003

What is Public Health Services & Systems Research?

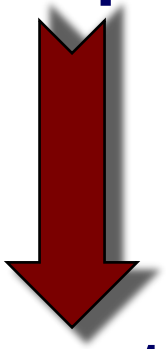
A field of inquiry examining the ***organization***, ***financing***, and ***delivery*** of public health services at local, state and national levels, and the ***impact*** of these activities on population health

Mays, Halverson, and Scutchfield. 2003

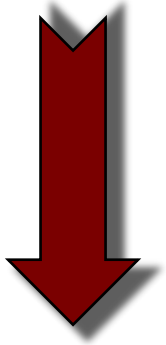
Developmental path for PHSSR

- Measuring practice & performance
- Detecting variation in practice
- Examining determinants of variation
  - – Organization
  - – Financing
  - – Workforce
  - – Law & policy
  - – Information
  - – Preference
- Determining consequences of variation
  - – Health outcomes
  - – Economic outcomes
  - – Medical care use
  - – Disparities
- Testing strategies to reduce harmful, wasteful, & inequitable variation in practice and outcomes

Descriptive



Inferential



Translational

What is Practice-Based Research in Public Health?

- Research that tests effectiveness & impact of public health practices in real-world ***public health settings***
- Research designed to address uncertainties and information needs of real-world public health ***decision-makers***
- Research that evaluates the implementation and impact of ***innovations in practice***
- Research that uses ***observations generated through public health practice*** to produce new knowledge

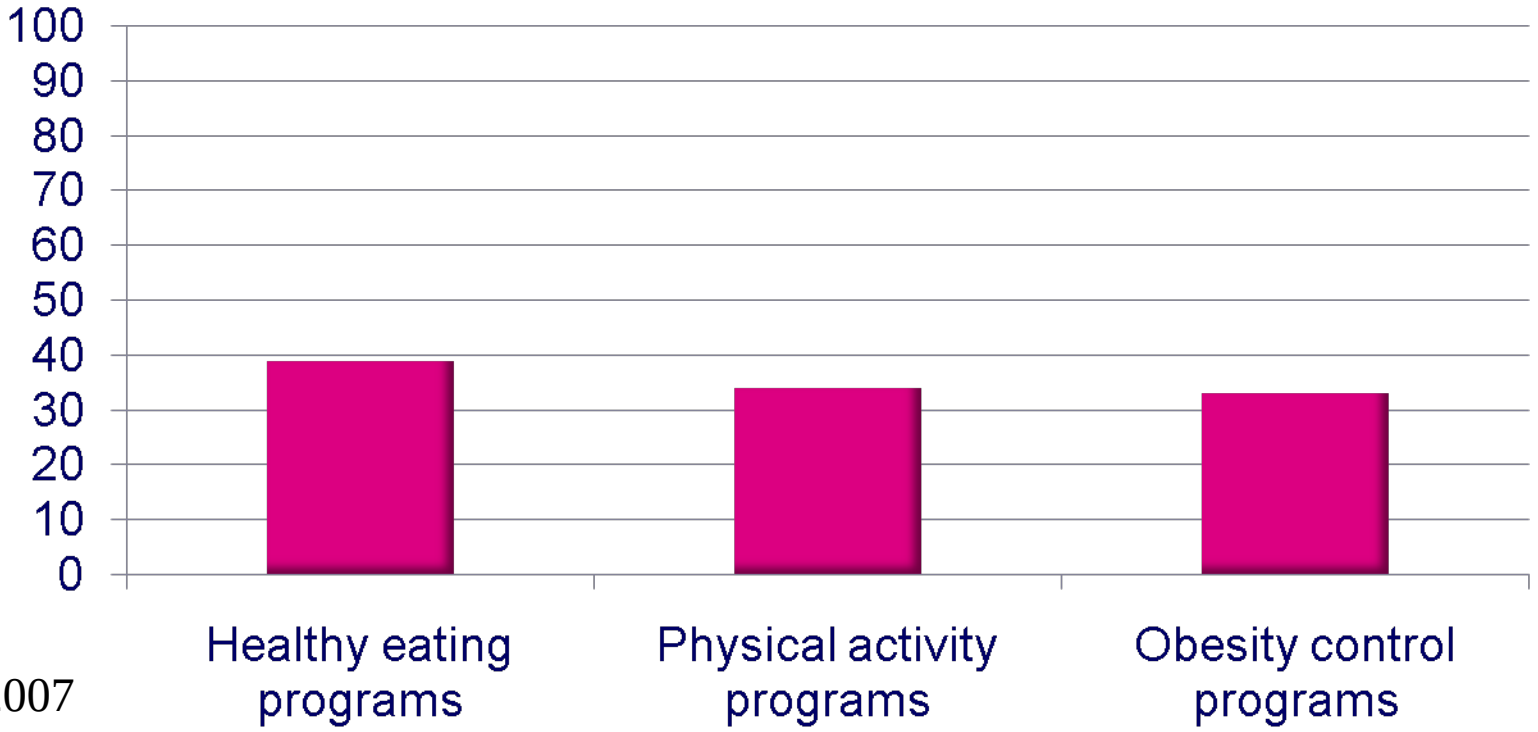
Examples: Adoption of evidence-based practices

Missed Opportunities

Local Health Departments as Providers of Obesity Prevention Programs for Adolescents

Sandy J. Slater, PhD, Lisa M. Powell, PhD, Frank J. Chaloupka, PhD

Percent of local health departments offering evidence-based obesity programs



Slater et al. 2007

Examples: Variation in agency performance

Local Variation In Public Health Preparedness: Lessons From California

Even in California—one of the best-prepared states—much work remains to ensure preparedness for a public health emergency.

by Nicole Lurie, Jeffrey Wasserman, Michael Stoto, Sarah Myers, Pokl Namkung, Jonathan Fielding, and Robert Burciaga Valdez

EXHIBIT 1
Characteristics Of Local Public Health Agencies (LPHAs) Participating In Test Of Response To Case Reports, 2004

LPHA	Region	Population served[a]	Urban/ rural[b]	Mean time until calls returned (minutes)	Longest period before calls returned (minutes)	Number of calls not returned	Percent "warm transfers"
1	Midwest	Small	Rural	93	630	2	44
2	Midwest	Medium	Rural	51	350	1	57
3	Midwest	Medium	Urban	4	6	0	88
4	Midwest	Large	Urban	14	30	0	50
5	Midwest	Large	Urban	10	23	0	38

Lurie et al. 2004

Examples: Variation in agency practice

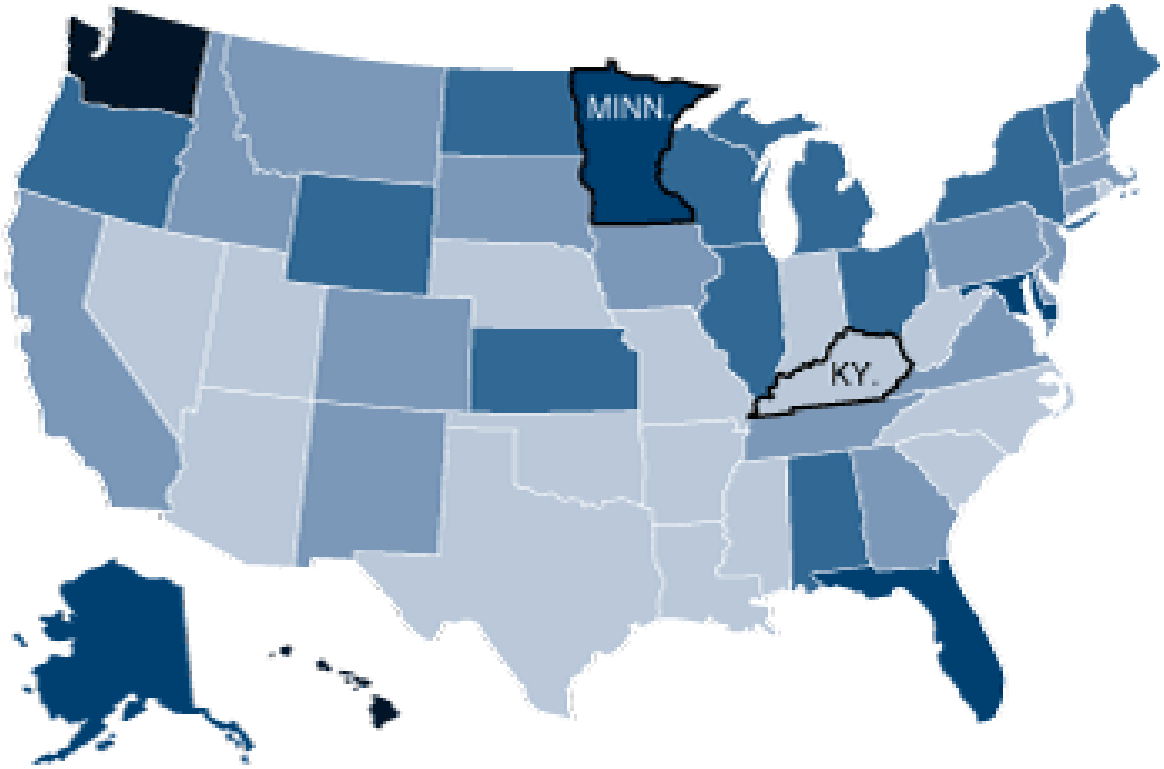
Mixed Results In Tracking Food Scares

Minnesota health officials investigate all reports of food-borne illness, but officials in many states do not. From 1990 to 2006, Minnesota reported 548 outbreaks, while Kentucky reported 18.

Reported outbreaks of food-related illness

Per 100,000 people, 1990 to 2006

Source: Centers for Disease Control and Prevention

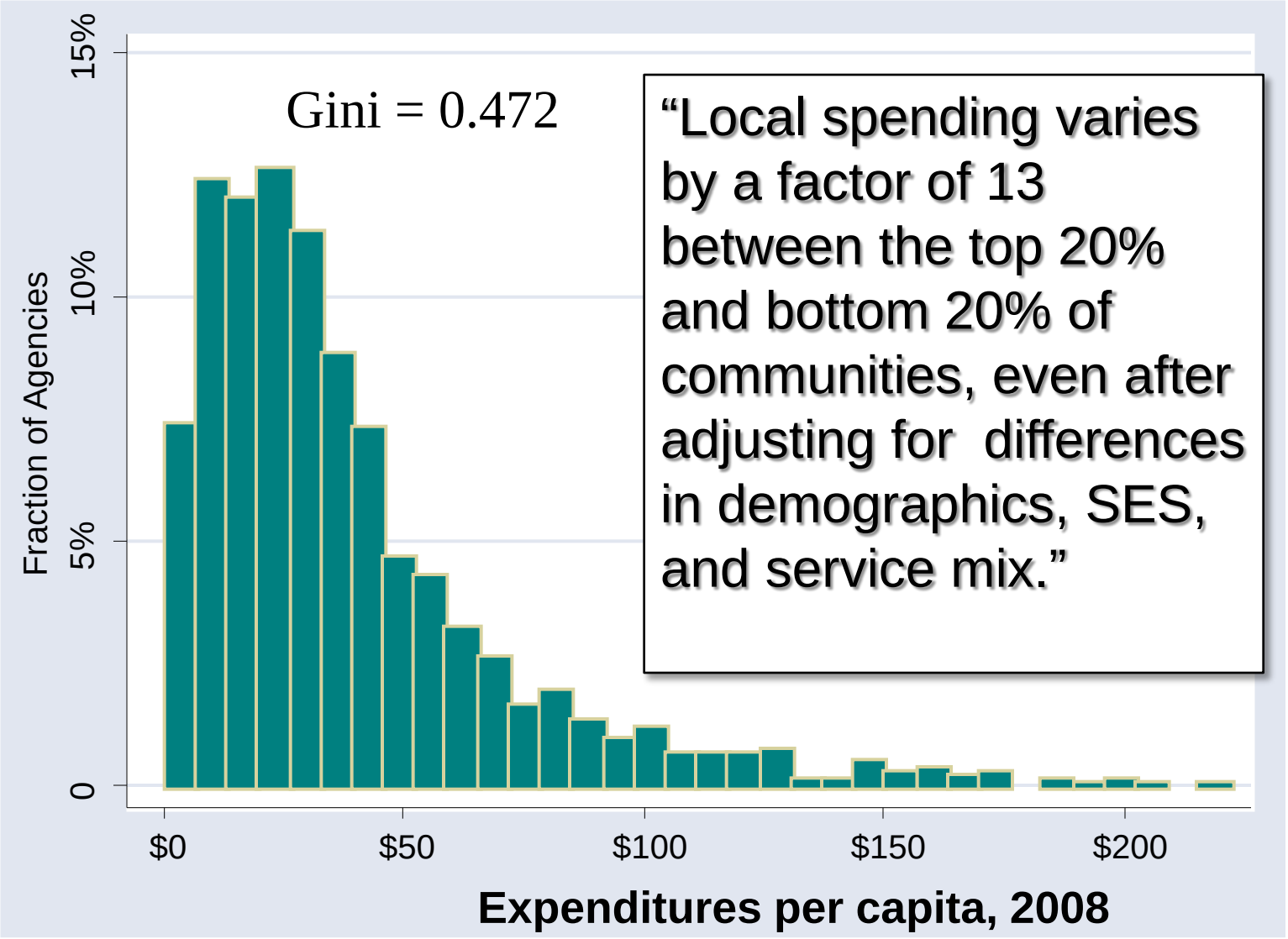


Fundamental empirical questions

- Which programs, interventions, policies (***mechanisms***)….
- Work best (***outcomes***)…
- In which institutional & community settings (***contexts***)…
- For which populations (***equity/heterogeneity***)…
- And why?

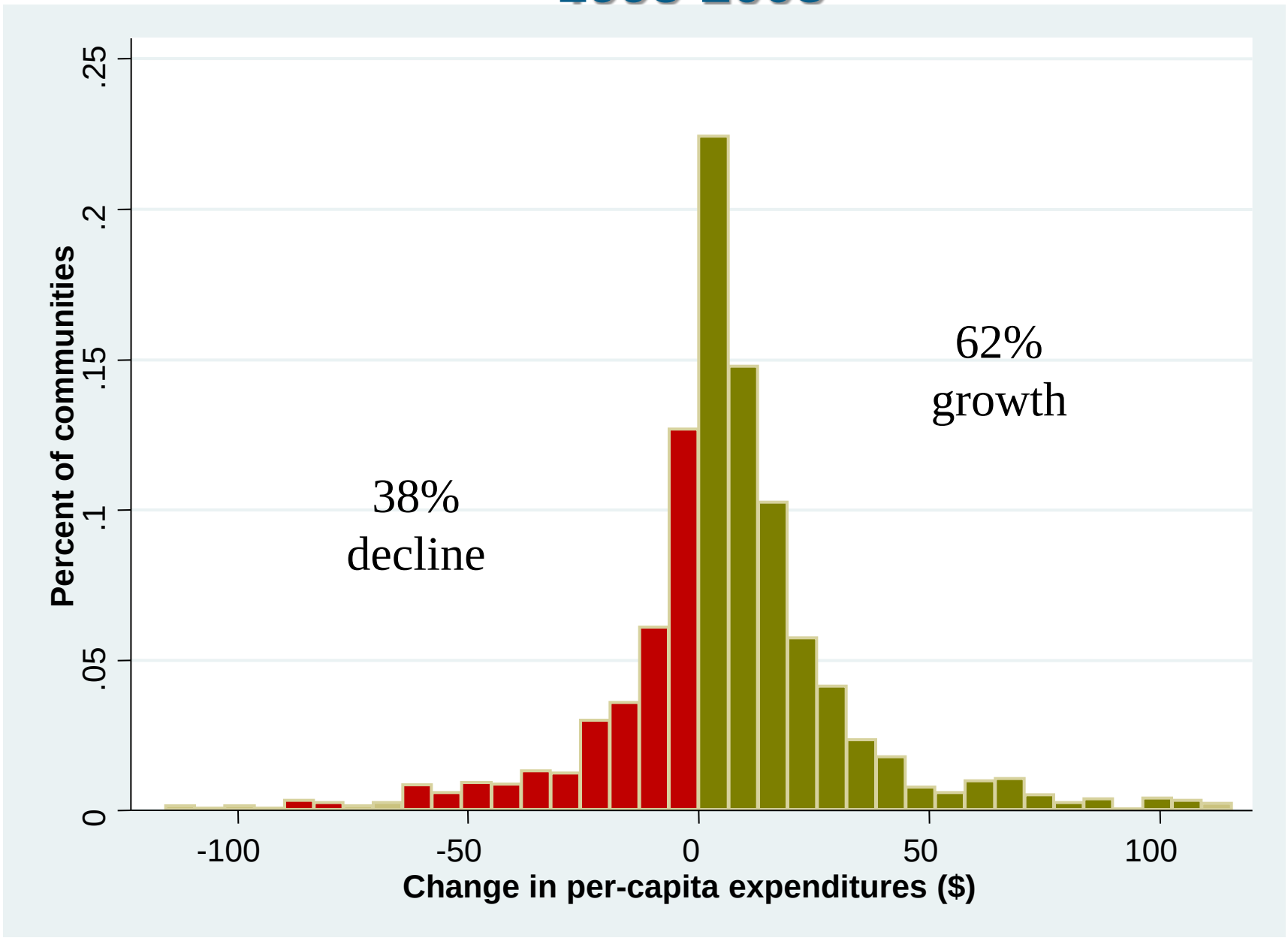
Pawson and Tilley 1997; Berwick 2008

Variation in Local Public Health Spending

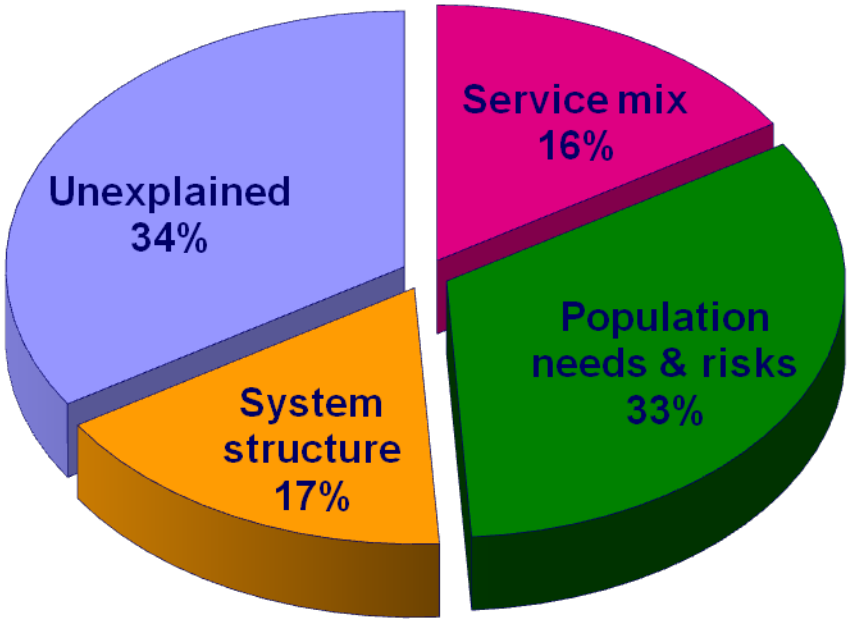


Mays et al. 2009

Changes in Local Public Health Spending 1993-2008



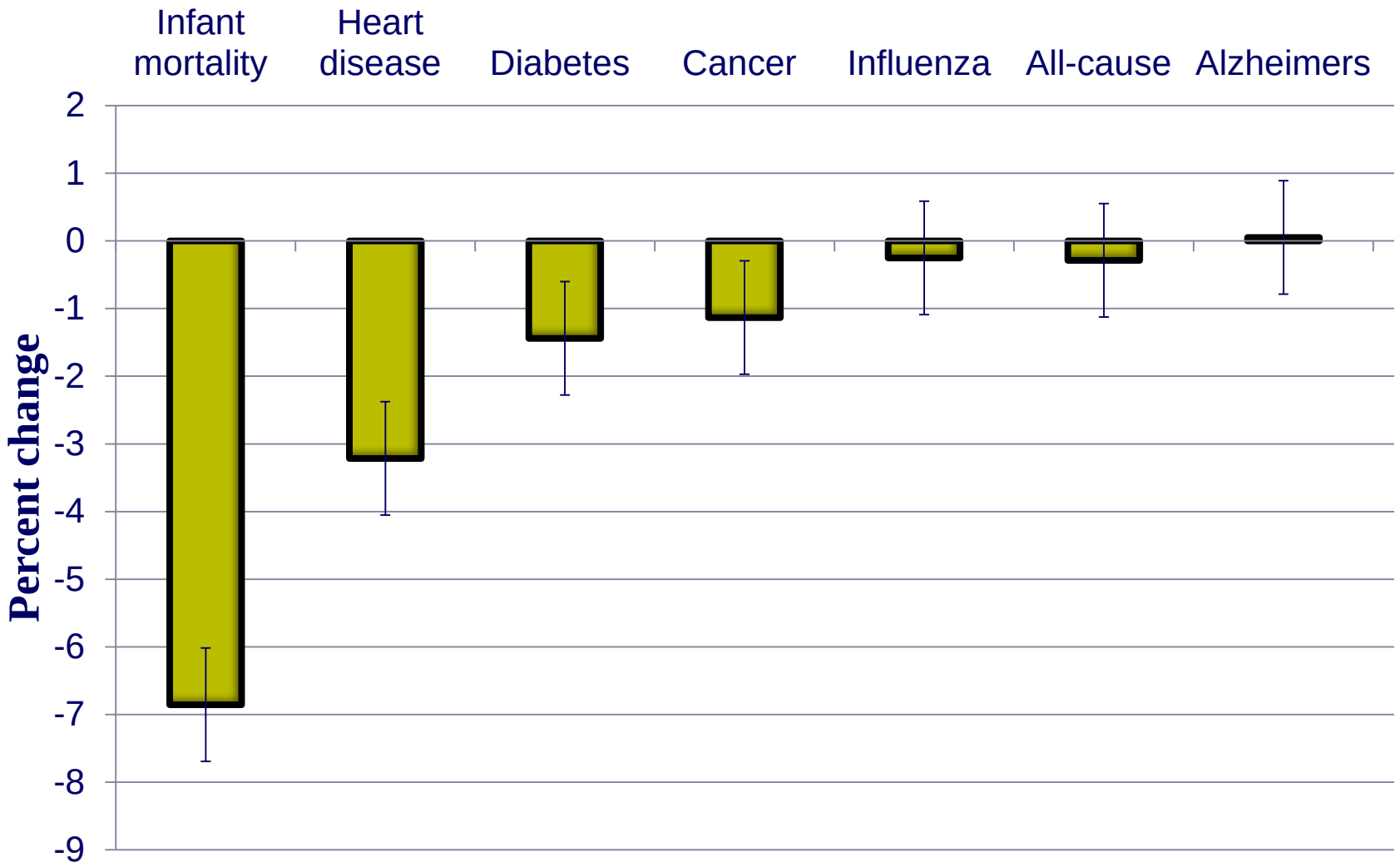
Drivers of geographic variation in public health spending



- Delivery system size & structure
- Service mix
- Population needs and risks
- Efficiency & uncertainty

Mays et al. 2009

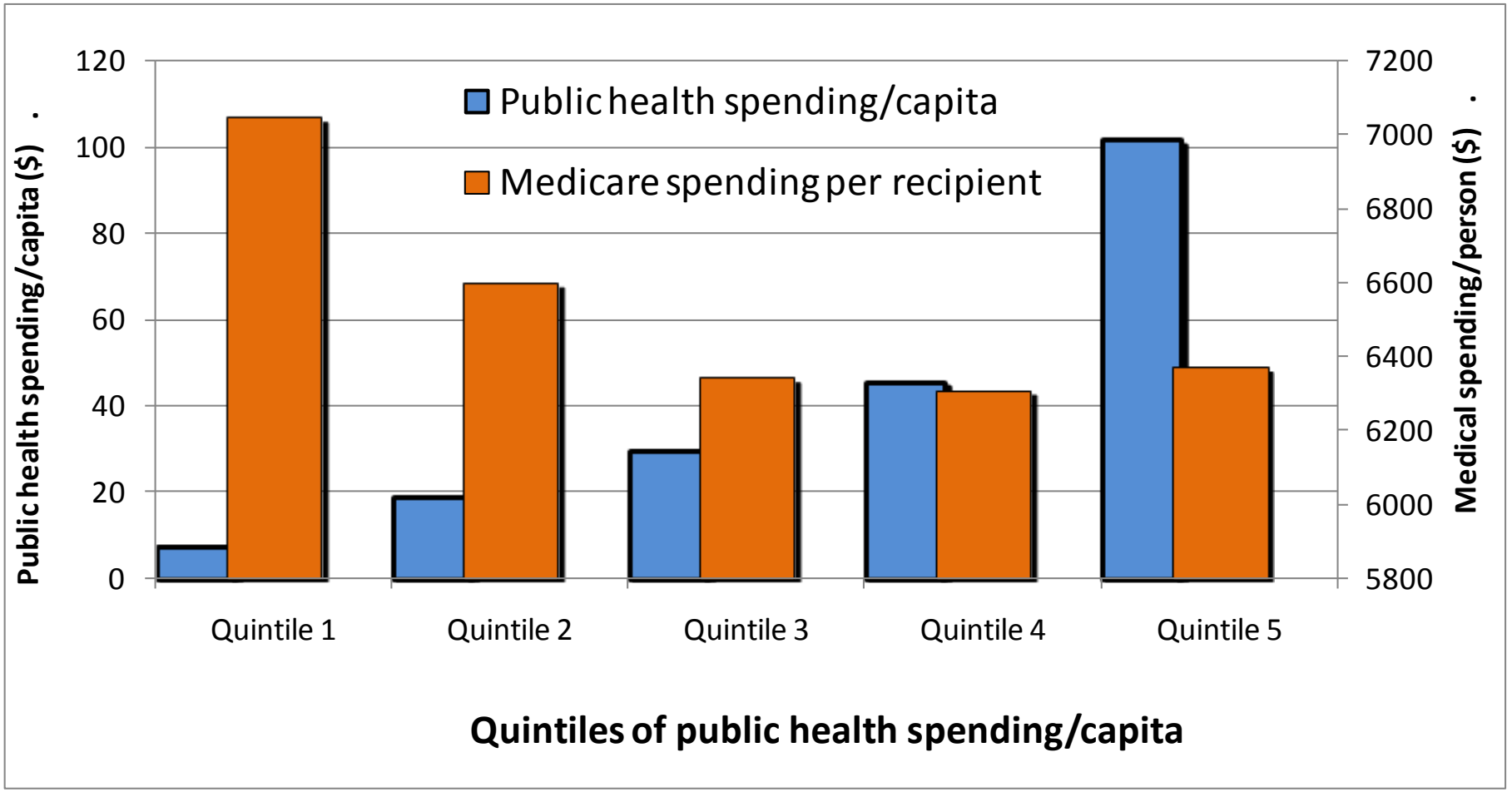
Mortality reductions associated with changes in public health spending



Hierarchical regression estimates with instrumental variables to correct for selection and unmeasured confounding

Mays et al. 2011

Public health spending and medical spending



Mays et al. 2009

Effects of public health spending on medical care spending 1993-2008

Change in Medical Care Spending Per Capita Attributable to 10% Increase in Public Health Spending Per Capita

Model	Elasticity	Std. Error
Fixed effects	-0.10	0.02 **
Instrumental variables	-0.88	0.13 **

Semi-log regression estimates controlling for community-level and state-level characteristics

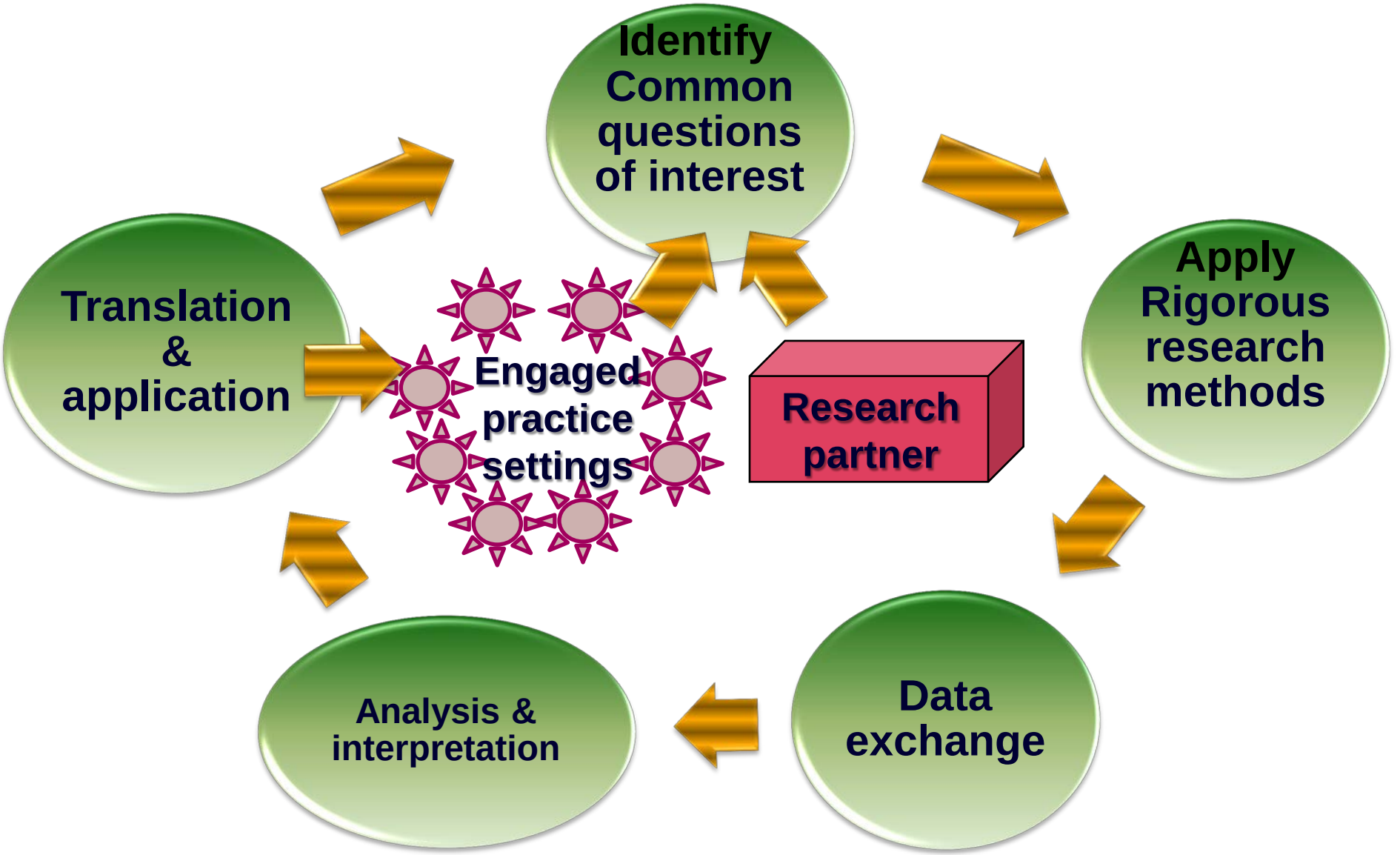
*p<0.10 **p<0.05 ***p<0.01

Projected effects of ACA public health spending

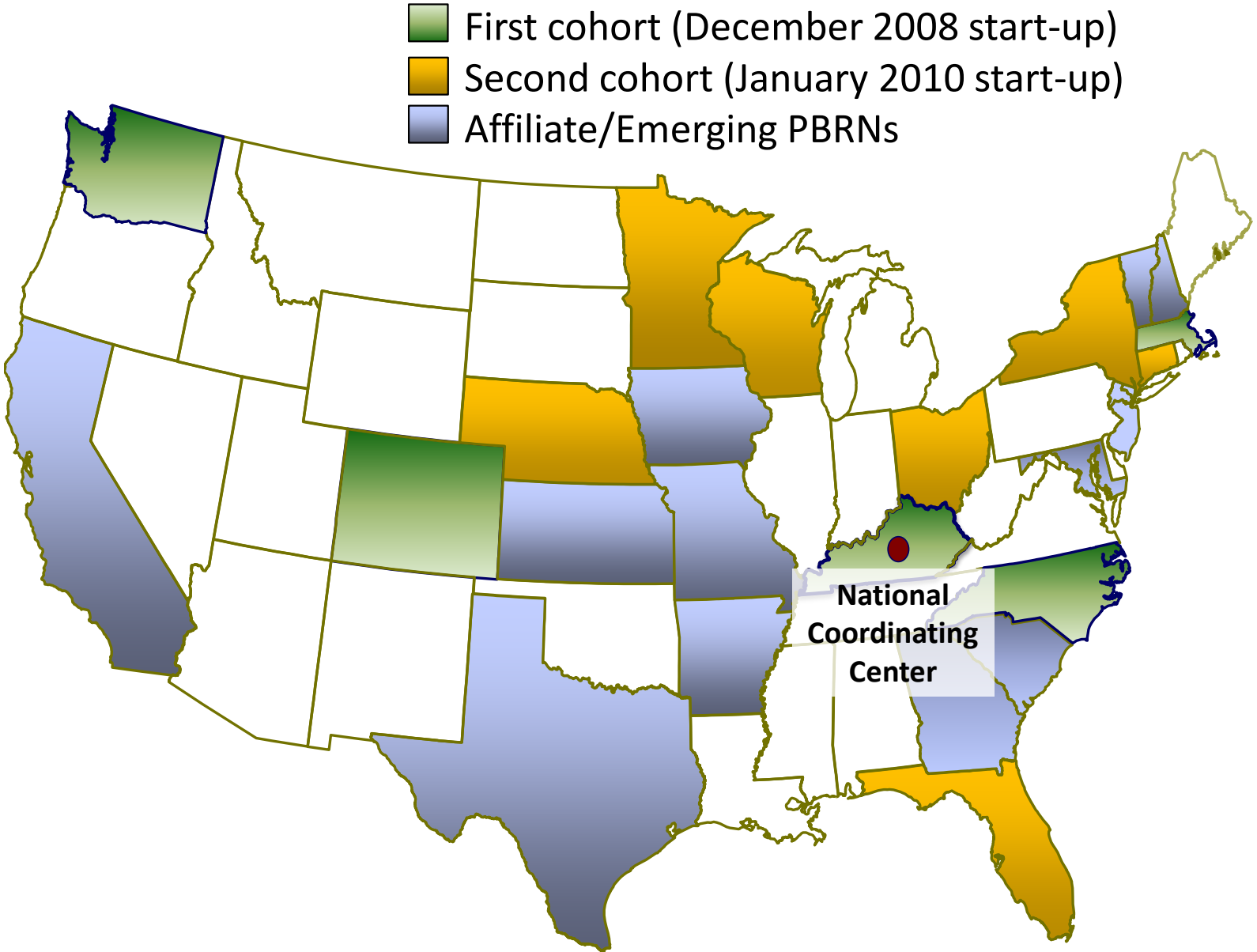
- $15B in **new** public health spending over 10 years:

Deaths averted:	255,000 – 437,000
Medical cost offset:	$2.2B – $6.9B
Cost/life-year gained	$9,800 – $22,400

The Logic of Public Health PBRNs



The Robert Wood Johnson Foundation's Public Health PBRN Program



Key elements of a Public Health PBRN

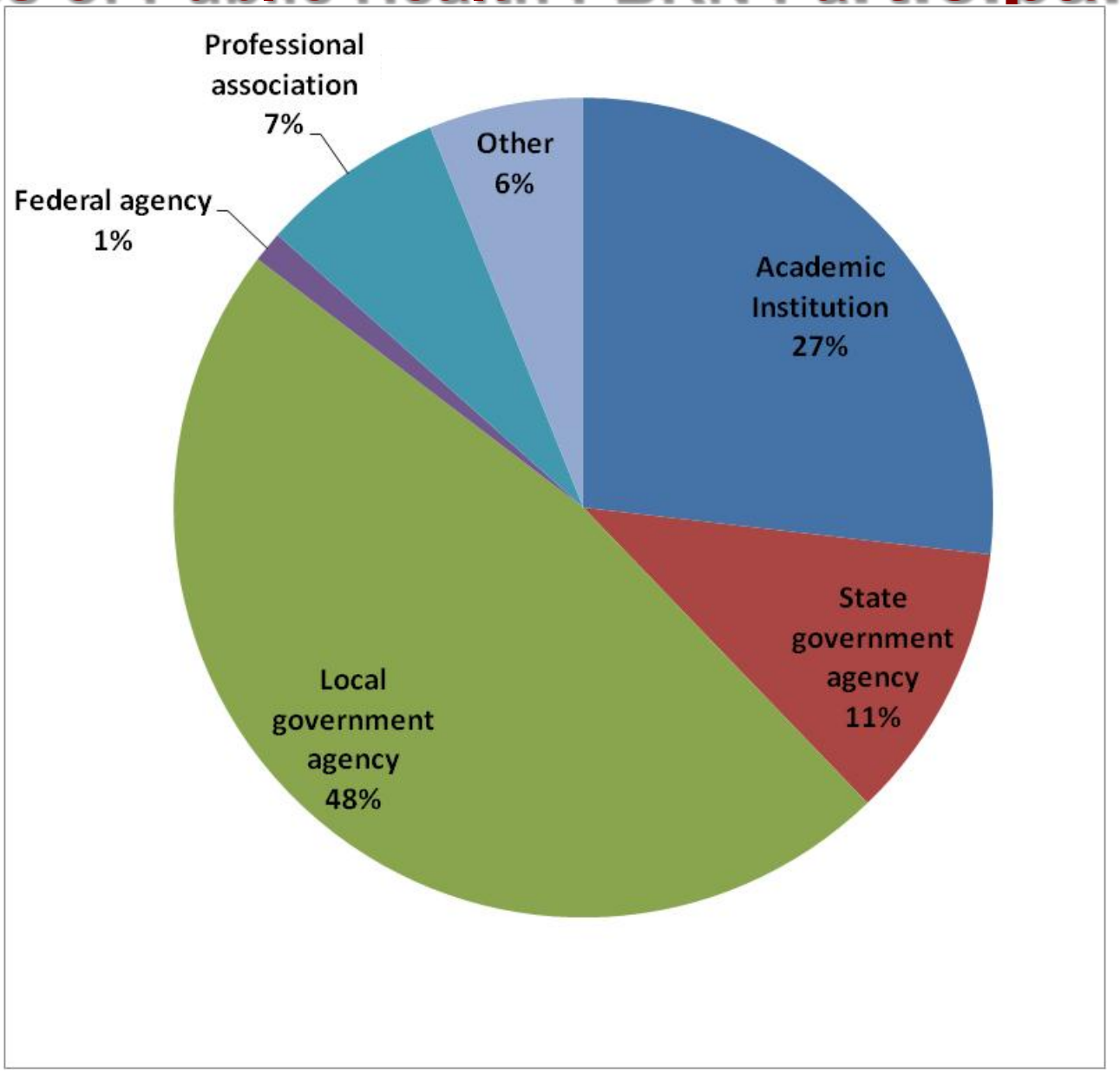
- ☑ State or local agency to serve as convener
- ☑ Multiple practice settings available for study
- ☑ Champion within each practice site
- ☑ Research partner with design and analysis expertise
- ☑ Regular communication among participants
- ☑ Feasible and relevant initial research projects

Composition of Public Health PBRNs

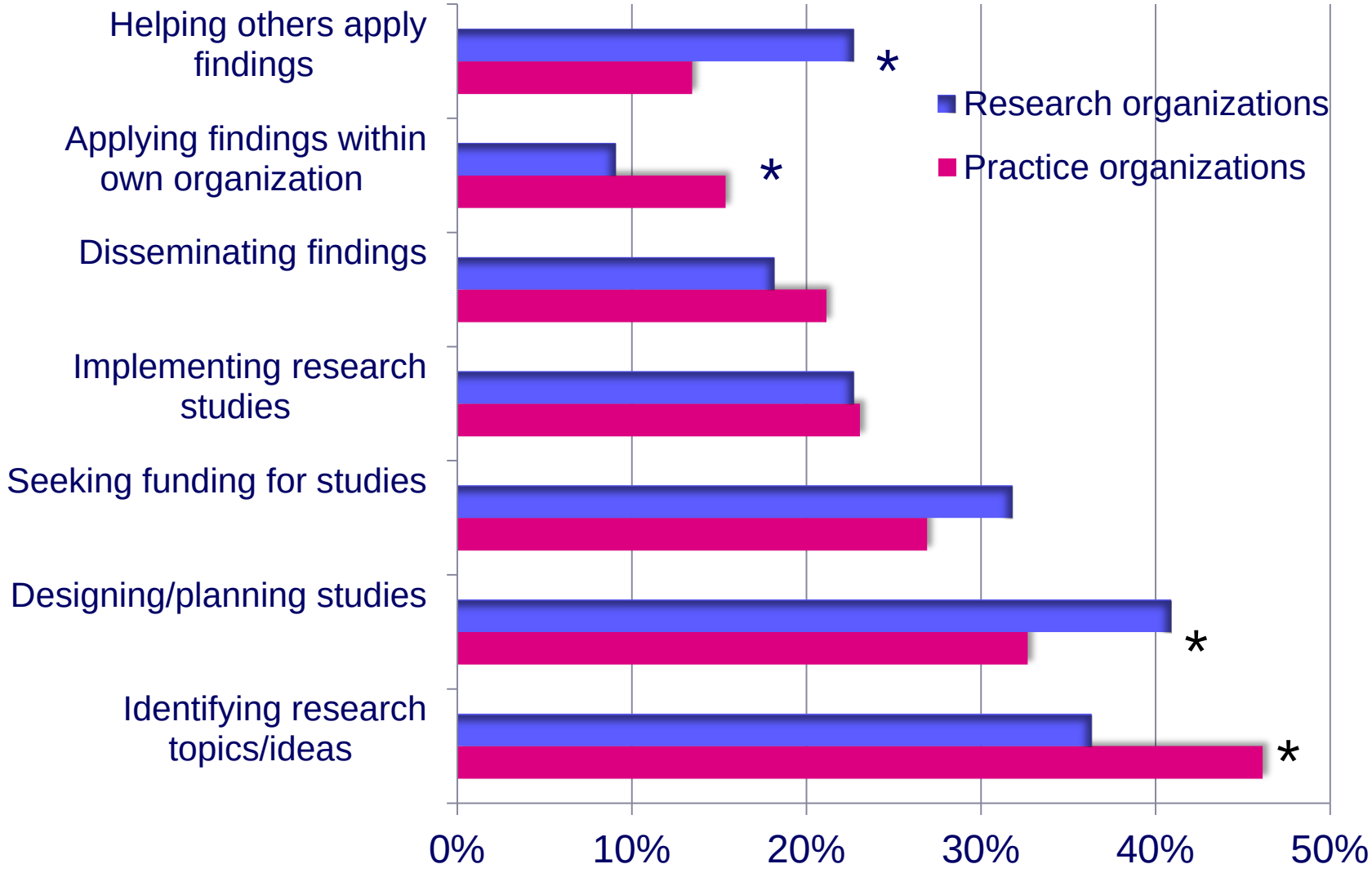
Network	State Agencies	Local Agencies*	Academic Units	Other	Total	Lead Institution
I. Supported Networks						
CO	1	55	2	15	73	Association
CT	3	40	3	5	51	Association
FL	1	67	3	3	74	Local agency
KY	1	17	1	1	20	Association
MA	1	15	1	2	19	Academic
MN	1	75	1	1	78	State agency
NC	2	8	1	1	12	Academic
NE	2	12	1	2	17	State agency
NY	1	56	3	2	62	State agency
OH	1	115	6	3	125	Academic
WA	1	36	2	1	40	Local agency
WI	1	42	3	2	48	Association
II. Affiliate Networks with Funded Projects						
GA	1	118	1	6	126	Academic
MO	1	115	3	1	120	Association
NJ	1	100	2	1	104	Academic
TN	1	16	2	1	20	Academic
Total	20	926	35	47	1028	

Examples: Studying PBRNs as Mechanisms

Types of Public Health PBRN Participants



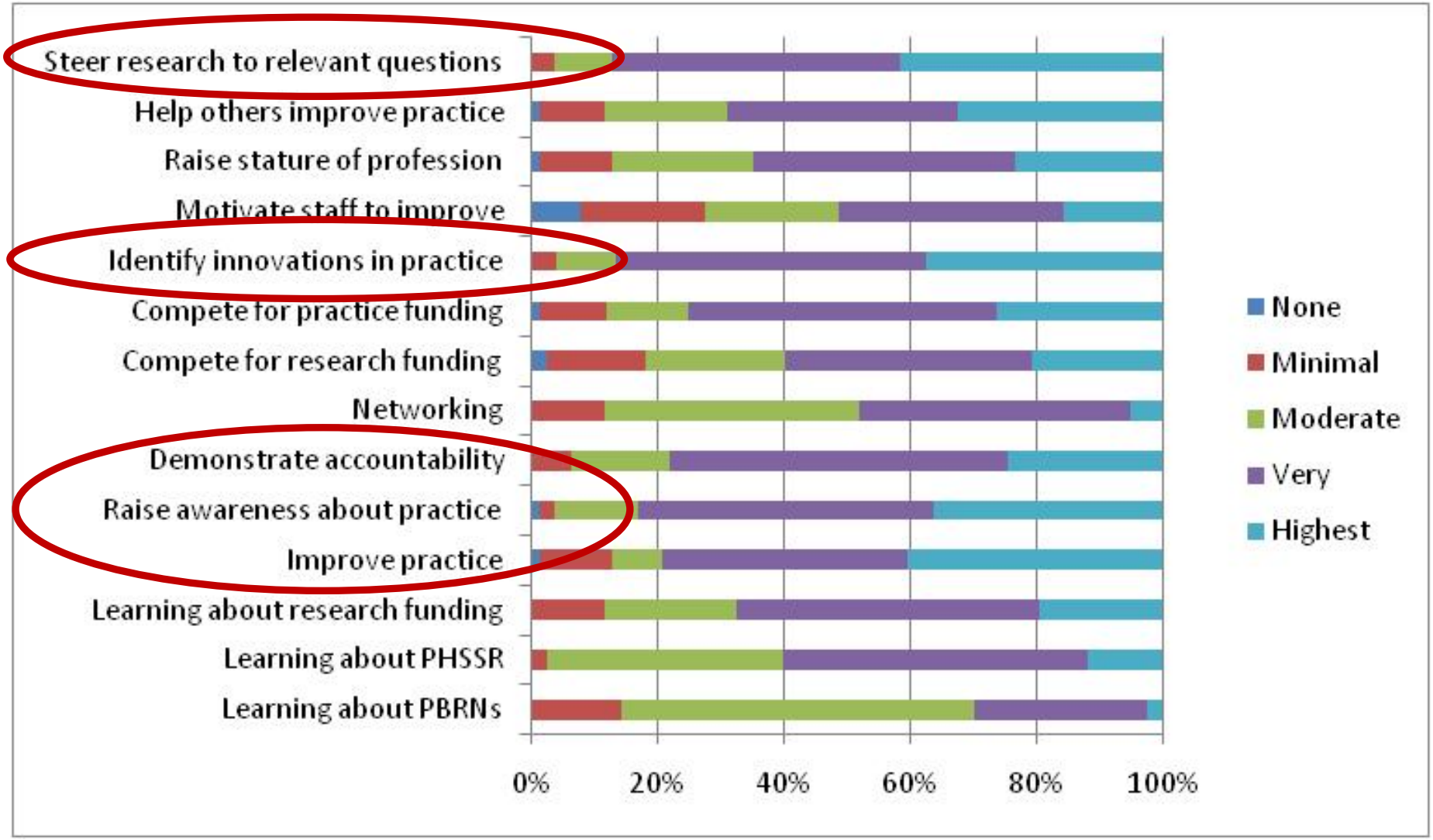
Roles played by participants in PBRN activities



*p<0.05

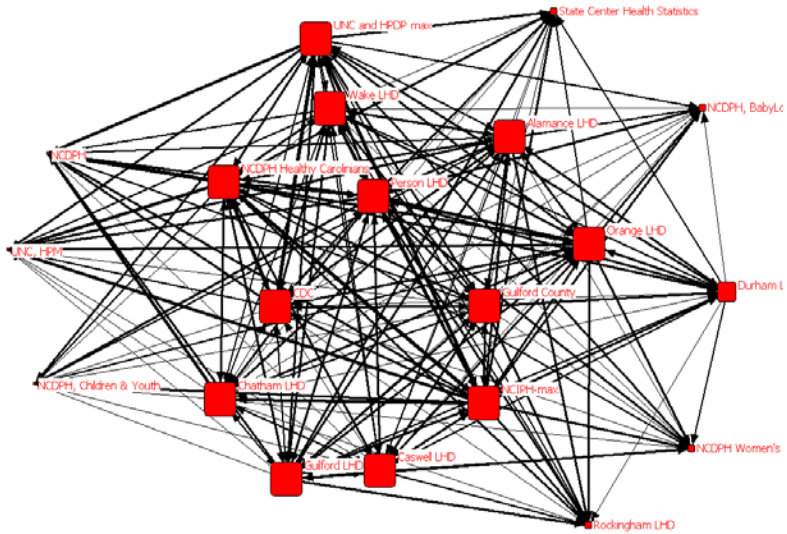
Examples: Studying PBRNs as Mechanisms

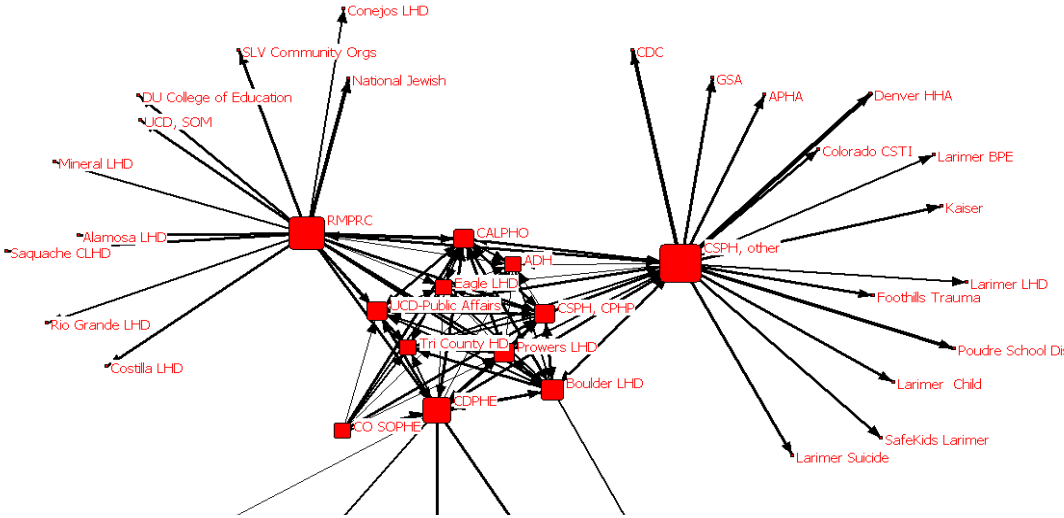
Benefits of PBRN participation

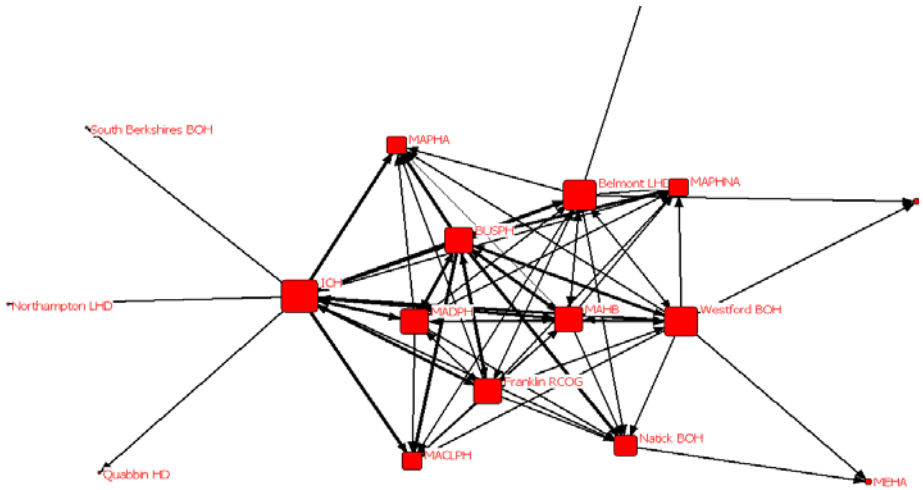


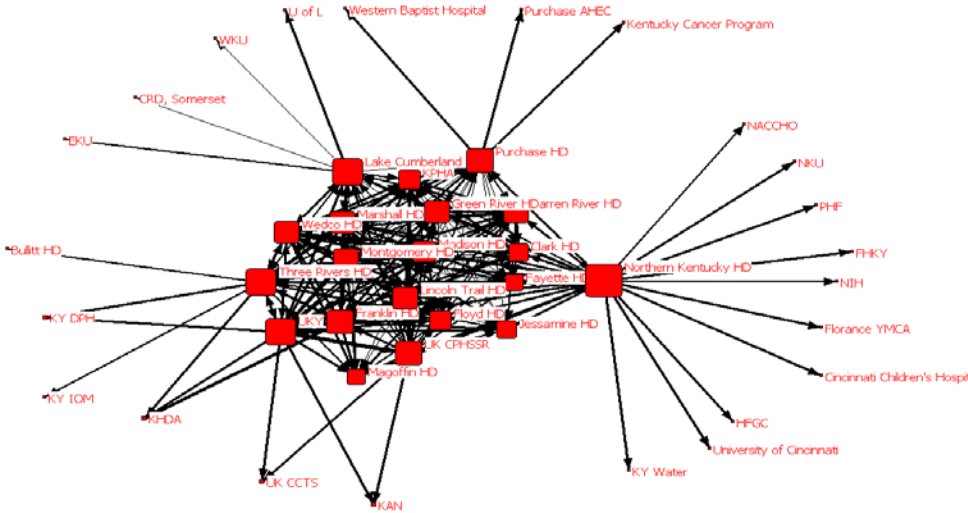
Examples: Studying PBRNs as Mechanisms

- Baseline network analysis with 5 cohort I PBRNs to examine ***network structures*** for evidence production and translation









Examples: Studying PBRNs as Mechanisms

Network Structures Associated with Perceived Benefits

	Perceived Benefit Rating	
Characteristic	**Coeff.**	**S.E.**
Network density	0.341	0.112**
Network centrality	-0.521	0.227**
History of collaboration	0.148	0.108
Practice orientation	0.283	0.144*

Estimates from ordered logit model controlling for PBRN random effects **p<0.05 *p<0.10

PBRN Research Projects

- ***Initial Projects***: Small-scale “proof-of-concept” studies conducted during initial 2 years of network development
- ***Research Implementation Awards***: Larger-scale research projects of 18-24 months
- ***Quick Strike Research Projects***: Time-sensitive, short-term research projects to study emerging issues in practice

Examples: Obesity prevention practices in CO

- ***Question of interest:*** How does the public health delivery system influence adoption and implementation of evidence-based strategies to promote healthy eating and active living through the LiveWell Colorado initiative?
- ***Practice settings:*** 25 local communities in CO
- ***Factors examined:***
  - Use of local data
  - Adherence to evidence-based strategies
  - Success strategies measured in RE-AIM
  - Network characteristics associated with success

- ***Study design:*** observational practice variation study, mixed-method

Examples: Communicable disease protection in MA

- ***Question of interest:*** How does the public health delivery system influence adoption and implementation of evidence-based strategies for food safety and infectious disease investigation?
- ***Practice settings:*** 351 municipalities in MA
- ***Factors examined:***
  - Adherence to consensus practices
  - Timeliness of investigation
  - Role of staffing, funding, IT, and partnerships

- ***Study design:*** observational practice variation study, mixed-method

Examples: Diabetes prevention in KY

- ***Question of interest:*** How does the public health delivery system influence adoption and implementation of evidence-based self-management strategies for diabetes?
- ***Practice settings:*** 6 health department jurisdictions serving 30 counties
- ***Factors examined:***
  - Adherence to EBPs
  - RE-AIM measures of success
  - Strength of collaboration

- ***Study design:*** pre-post design with QI intervention

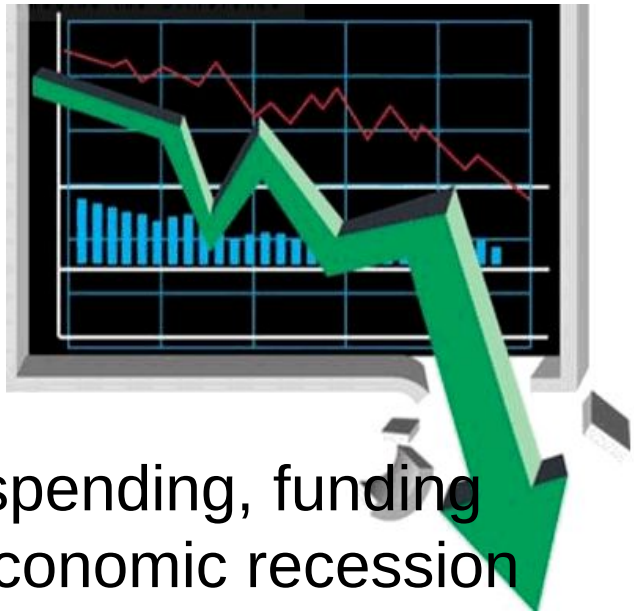
Two dominant themes in PBRN research: evidence-based management

- How best to prioritize and allocate resources in response to ***economic shocks***
- What ***regionalized service delivery*** models produce gains in capacity, efficiency, effectiveness

Source: Congressional Budget Office based on data from the Centers for Medicare and Medicaid Ser

Examples: Economic Shocks and Decisions

- ***Washington:*** Variation in LHD budget reductions during the 2009-10 economic downturn, and how the reductions have affected service delivery and use of evidence-based practices
- ***North Carolina:*** LHD responses to Medicaid maternity case management funding cut, and impact on service delivery
- ***Connecticut:*** Responses to elimination of state subsidies to small LHDs
- ***Ohio:*** LHD enforcement of smoke-free workplace act (magnitude & frequency) in response to economic downturn



- ***Wisconsin & Florida:*** Changes in LHD spending, funding sources and resource allocation during economic recession

Examples: Regionalized Service Delivery

- ***Massachusetts:*** Local variation in decision-making and implementation regarding regional delivery models
- ***Nebraska:*** How do organizational design and workforce issues affect implementation of regional health department models
- ***Connecticut:*** How do state-mandated services and funding reductions influence decision-making regarding regional models
- ***Colorado:*** Impact of state public health law reform on regional approaches to service delivery; variation in local legal instruments and approaches to regionalization

Examples: Studying Production Processes

Estimating the Production Functions for Public Health Services

- ***Production studies:*** Research on production processes for physician services, hospital services, and other medical providers have been conducted since the late 1960s
- ***Public health management issues to be addressed***:
  - Resources and staffing needed to produce a given bundle of public health activities
  - Efficiency and productivity metrics
  - Defining public health underserved areas
  - Forecasting future workforce needs
  - Estimating returns to regionalization, economies of scale, volume-outcome relationships

Examples: Studying Production Processes

Estimating the Production Functions for Public Health Services

Types of Output Measures of Interest

- ***Availability/Scope:*** specific activities produced
- ***Volume/Intensity:*** Frequency of producing activity over period of time
- ***Capacity:*** Labor and capital inputs assigned to an activity
- ***Reach:*** Proportion of target population reached by activity
- ***Quality:*** appropriateness, effectiveness, equity of activity
- ***Efficiency:*** resources required to produce given volume of activity

Implications and Next Steps

- Public health PBRNs can serve as effective mechanisms for implementing and disseminating research in public health settings
- The structure of PBRN networks may shape the distribution of benefits and costs of research participation
- Practice partners who are more marginal in their PBRN networks appear to benefit most
- For sustainability, PBRNs must ensure that practice partners realize tangible benefits from research participation:
  - Decision support - Quality improvement
  - Accreditation - Efficiency

Public Health
Prevent. Promote. Protect.

Conclusions: getting inside the box

- Engagement of practice and research partners
- Sensitive and specific measures
- Research designs in real-world settings

- What works best
  in which settings and why
- Informed public health decisions
- Smarter investments and greater value

For More Information

PUBLIC HEALTH
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National Coordinating Center

Supported by The Robert Wood Johnson Foundation

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